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Indian Standard
STORAGE MANAGEMENT CODE
PART II GENERAL CARE IN HANDLING AND STORAGE OF AGRICULTURAL PRODUCE AND INPUTS

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 1

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STORAGE MANAGEMENT CODE

PART II GENERAL CARE IN HANDLING AND STORAGE OF AGRICULTURAL PRODUCE AND INPUTS

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Indian Standard

STORAGE MANAGEMENT CODE

PART II GENERAL CARE IN HANDLING AND STORAGE OF AGRICULTURAL PRODUCE AND INPUTS

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 30 November 1971, after the draft finalized by the Storage and Marketing Structures for Agricultural Commodities Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Scientific storage of agricultural produce and inputs demands proper care of different commodities, construction of appropriate type of storage structures suitable for different commodities; hygienic transport, receipt, distribution and delivery of these commodities; maintenance of warehouse inspection records; etc. The standardized norms of storage management would help in overcoming problems of recurring nature like general and specific care of agricultural commodities, calculation of storage space for various commodities, occupancy of storage structures, and calculation of cost of storage and construction. Such a code would, therefore, lead to overall improvement in storage at farmers', trade and government level and ultimately to overall economy in the storage of various agricultural commodities.

0.3 In India, there is a huge avoidable loss of agricultural produce and inputs during handling and storage. The loss may be due to faulty handling or storage in structures not equipped with provisions for minimizing the risk of infestation by insects, micro-organisms or rodents; seepage of ground and rain-water; and development of temperature gradient.

0.3.1 In addition to the insect pests given in Appendix A, mites, psocids, ants and termites, etc, also become a nuisance at times in stored food grain. The presence of mites and psocids in large numbers gives the food grain a musty odour and due to their droppings, cast skins, etc, the food grain product becomes rancid and unwholesome. Ants do not infest the food grain but remove it to their nests built in the neighbourhood of storage structures.

0.3.2 As regards dampness or moisture, it affects stored food grain in many ways. Due to the absorption of excess moisture by food grain, its rate of respiration increases which produces more heat and the food grain may start ' heating '. Even if the quantity of moist or damp food grain within a food grain mass be small, it may act as a centre for spreading ' heating '.

The process of such spreading of 'heating' takes place in the following manner:

> The heated air from the radiating point travels to cooler parts in the food grain mass, carrying along with it a higher percentage of moisture. The moisture brought by the heated air is condensed in the cooler parts resulting in the increase of the moisture content of the food grain there. With the increase of the moisture content in the food grain in cooler parts, the rate of respiration is accelerated and the original cooler parts start 'heating'. This phenomenon of transmission of moisture from one part to the other and subsequently, 'heating' continues in a cycle till arrested. Excessive 'heating' may result in cake formation. Micro-organisms also readily attack moist food grain. Increased moisture content of food grain due to dampness or moisture helps in the acceleration of insect breeding if the food grain is already infested. Sometimes, wet grain may sprout.

0.4 During transport, receipt and issue of agricultural produce and inputs avoidable losses often occur either due to negligence or ignorance on the part of the personnel handling the bags. Such losses may be due to spillage of food grain during loading and unloading, or due to faulty conveyance or vehicle, which may damage the bags, permitting the food grain to spill. The conveyances may be dirty and may contain deleterious contaminations or undesirable refractions which may be picked up by the bags of food grain transported in them. During rains, while transporting bags of agricultural produce and inputs, adequate protection may not be provided, and the food grain may become moist or wet which may subsequently result in its becoming heated, fungus attacked or caky. Though in India, vehicles are not earmarked for the transport of bags of food grain, in port towns and procuring or distributing centres, some vehicles are used continuously for a number of days for transporting bags of grains. In such vehicles at times, bags containing insect infested commodities may be transported but, for want of disinfestation measures, insects may remain lurking in them. Such vehicles may thus form a source of insect infestation to the bags containing uninfested food grain.

0.5 The loss may, therefore, be avoided by scientific handling and storage. Besides the general norms of handling and storage of some agricultural produce and inputs, a number of them demand special care and arrangement. The agricultural produce and inputs which do not require any specific care or arrangement are food grains, oilseeds, sugar, tobacco, spices and implements, while those which require specific arrangement are fertilizers, pesticides, chillies, jaggery, seeds and cotton.

0.6 With a view to providing general information on causes of loss in handling and storage of agricultural produce and guidelines on norms of scientific handling and storage of general and specific agricultural produce and inputs which would lead to better storage awareness and conditions in the country, this Indian Standard has been formulated.

0.7 This code supersedes IS : 610-1955* and IS : 611-1955† which dealt with food grains only and needed revision to incorporate the latest storage techniques and fumigation practices. The present code has an enlarged scope and also incorporates the relevant provisions given in the above standards.

0.8 This code is being formulated in three parts. Other two parts will be as follows:

Part I Terminology

Part III Specific care in handling and storage of agricultural produce and inputs

0.9 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960‡. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part II) prescribes general care in handling during transport, receipt and issue; and storage of agricultural produce and inputs.

1.1.1 This standard does not deal with care of such commodities which require cold storage.

2. TERMINOLOGY

2.0 For the purpose of this standard, the definitions of terms given in Part I of this code shall apply. In addition, the following abbreviations have been used in the standard.

2.1 ALP — Aluminium phosphide.

2.2 BGSS — Bag storage structure.

2.3 BKSS — Bulk storage structure.

2.4 EDB — Ethylene dibromide.

2.5 EDCT — A mixture of ethylene dichloride and carbon tetrachloride in the ratio of 3 :1 (by volume).

2.6 MBR — Methyl bromide

2.7 AGPI — Agricultural produce and inputs.

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*Code of practice for storage of food grain and its protection during storage.

†Code of practice for handling of food grain in transit.

‡Rules for rounding off numerical values (*revised*).

3. HANDLING OF AGPI IN TRANSIT

3.1 Head or Shoulder Loads, or Animal Packs

3.1.1 Head or shoulder loads or animal packs of AGPI shall be made up in a suitable sheet or bag of sufficiently large size, so that when the loads or packs are completed, the AGPI does not ooze or spill out of them.

3.1.1.1 *Sheet* — The sheet of textile fabric used for making loads or packs of AGPI shall be sound, clean and dry. It shall be sufficiently strong so as to sustain the lateral pressure of AGPI packed inside and not tear even in the event of the loads or packs inadvertently falling from a small height. If the same sheet is used over and over again for making loads of packs of AGPI, such a sheet shall be well beaten every time prior to its re-use so that insects adhering to the sheet, if any, are removed. If the sheet contains plenty of insects, it shall be dipped in a suitable insecticidal preparation or fumigated as given in Appendix B.

3.1.1.2 *Precautions for transport* — The loads or packs of AGPI, either at the loading or unloading point, shall not be kept at a dirty or damp place or a place considered otherwise deleterious for keeping AGPI. During their transport, they shall be held secure so that they do not drop or otherwise get damaged, and shall always be well protected from rain.

3.2 Bags

3.2.1 *Empty Gunny Bags for Filling of AGPI* — AGPI meant for transport shall be filled in sound, clean, insect-free and dry empty gunny bags. Empty gunny bags which are damaged due to moisture, or fungus, or are contaminated with deleterious substances, or those which have patches or cut portions exceeding 50 mm, shall not be used for transport of AGPI. Such of the empty gunny bags which have cut or torn portions not exceeding 50 mm, shall be so repaired that AGPI does not leak through them.

3.2.1.1 Empty gunny bags which have been used previously for storage or transport of AGPI shall be disinfested by dipping in a suitable insecticidal preparation or by fumigation by the method prescribed in Appendix B before filling them with AGPI.

3.2.2 *Uniformity of Bags* — The bags of single consignment shall be of uniform size and weight, and shall contain the same type of AGPI. If the bags are slack, they shall be made up to the standard weight of the bags of the consignment prior to loading in conveyance.

3.2.3 *Stitching of the Mouth of a Bag* — The mouth of each bag meant for transport shall be stitched with machine or manually in which case the mouth shall be rolled over and given 14 stitches in each row. In case of machine stitching 3-ply thread stitching with 18 twist giving about 5 stitches in 2·5 cm shall be used.

3.2.4 *Protection Against Rain* — Bags shall not be loaded or unloaded or otherwise handled in the open if it is raining.

3.2.5 *Loss in Weight of Bags During Transport* — During transport of a consignment of bags either in a vehicle, wagon or a boat, or in any other conveyance, no tolerance for loss in weight of total bags shall be allowed except in case of a cargo of a boat having been jettisoned during voyage. For determining loss in weight of bags during transport, as far as possible, 100 percent bags of a consignment meant for transport shall be weighed prior to loading in either a vehicle, wagon or a boat, or in any other conveyance, at the loading point, and then again re-weighed at the unloading point.

3.2.5.1 Failing 100 percent weighment of bags and in the absence of an agreement between the consigner, the transporting organization and the consignee, regarding the percentage of the bags to be weighed, the scale given in Table 1 is suggested as a guide for determining the total weight of the consignment.

TABLE 1 SUGGESTED SCALE FOR WEIGHING OF BAGS OF A CONSIGNMENT

SL No.	SIZE OF THE CONSIGNMENT IN NUMBER OF BAGS	NO. OF BAGS TO BE WEIGHED, PICKED AT RANDOM	PERMISSIBLE DIFFERENCE IN AVERAGE WEIGHT PER BAG AT DIFFERENT WEIGHING POINTS IN g
(1)	(2)	(3)	(4)
i)	Under 50	10	300
ii)	50 to 99	15	240
iii)	100 ,, 199	20	200
iv)	200 ,, 299	25	175
v)	300 ,, 499	30	150
vi)	500 ,, 999	50	125
vii)	1 000 ,, 5 000	100	100

NOTE — This table assumes normal variation of 450 g in the weight of individual bags and guarantees against loss in weight in 95 percent of cases.

3.2.5.2 If the total weight of a consignment is found to vary at any one weighing point from that at any other weighing point by more than the permissible difference specified in col 4 of Table 1, the consignment shall be considered to have undergone loss in weight during transit.

3.3 Transport of Bags by Animal Driven or Motor Vehicle

3.3.1 *Vehicle* — A vehicle which is either damp, dirty or containing deleterious contamination shall not be used for the transport of bags.

3.3.1.1 The vehicle shall have a sound floor so that even if the bags burst or otherwise get damaged during transport, the AGPI does not spill out of the vehicle. The floor of the vehicle shall be scrubbed clean and dry.

3.3.1.2 In case of bulk transport of AGPI, a sound, clean and dry sheet of a suitable size shall be spread in the vehicle so as to cover the entire floor space of the vehicle, where necessary, to avoid leakage.

3.3.1.3 If the same vehicle is used continuously for transporting bags, the floor and sides of the vehicle shall be sprayed with 0·5 percent malathion emulsion by the method prescribed in Appendix C, on every seventh day of the continuous use of the vehicle.

3.3.2 *Loading of the Bags in the Vehicle* — A vehicle shall not be loaded to more than its certified capacity.

3.3.2.1 Prior to the commencement of loading of bags in the vehicle, sound, clean and dry sheets of suitable size shall be spread on the ground all along the passage from the loading point to the vehicle and also round about the vehicle so that all spillages of food grain during loading of the bags fall on the sheet and not on the ground. If the spillages are perfectly clean, they shall be bagged and put in the same consignment; if the spillages got dirty, they shall be treated as sweepings in the manner given under **3.3.2.2**.

3.3.2.2 *Sweepings* — Sweepings shall be sieved, winnowed and cleaned, and the sound food grain recovered. The recovered sound food grain shall be blended with rest of the grain and bagged. The remnants of the sweepings, after the recovery of the sound food grain, shall be disposed of by burning, dumping or for industrial or manurial use.

3.3.2.3 *Stacking of bags in the vehicle* — The bags shall be stacked in the vehicle according to a stack plan avoiding bays and lop-sided heaping and also ensuring compact and balanced stacking so as to make the bags least susceptible to movements and jerks due to the movement of the vehicle.

3.3.3 *Securing of Bags on the Vehicle* — The stack in the vehicle shall be tied securely so that when the vehicle is in motion, the bags do not get dislodged or drop out.

3.3.3.1 During rainy weather, the stack in the vehicle shall be covered with sound, clean and dry waterproof tarpaulins in such a manner that when it rains, the water does not reach the bags. The loose edges of the tarpaulins covering the sides of the stack shall be well spread over so as to hang free over the sides of the vehicle and not tucked under the stack.

3.3.4 *Despatch Order* — The supervisor of the vehicle, before the vehicle leaves the despatching point, shall be handed over a despatch order bearing the following information:

a) Date of despatch;
b) Kind of vehicle;

c) Vehicle No.;
d) Name of driver;
e) Kind of AGPI;
f) Total number of bags;
g) Average weight of a bag;
h) Gross weight of the vehicle;
j) Gross weight of the bags (if available);
k) Despatching point;
m) Receiving point;
n) Approximate mileage between the despatching point and receiving point;
p) Approximate time required for the vehicle to cover the distance;
q) Signature of despatching authority, with designation; and
r) Name and address of consignee.

3.3.5 *Checking of Contents of Despatch Order at the Unloading Point* — On arrival of the vehicle at the receiving point, the receiving authority shall check up all the information given in the despatch order (*see* **3.3.4**).

3.3.6 *Unloading of Bags from the Vehicle* — Prior to the commencement of unloading of the vehicle, sound, clean and dry sheets of suitable size shall be spread on the floor all along the passage from the vehicle to the unloading point and also round about the vehicle so that all spillages of food grain during unloading of the bags fall on the sheet and not on the ground. If the spillages are perfectly clean, they shall be bagged and put in the same consignment; if the spillages get dirty, they shall be treated as sweepings and shall be dealt with in the manner given under **3.3.2.2**.

3.4 Transport of Bags by Railway Wagon

3.4.1 *Storage of Bags at Despatching Station* — The floor, on which stacks are built, shall be dry and clean. As far as possible, care shall be taken to provide a place having a leak-proof roof and sound solidly built floor for the storage of bags. If the floor is not solidly built, or is otherwise unsuitable for the storage of food grain, dunnage of either old discarded rails or timber pallets or 10 x 10 cm timber squares shall be laid on the floor before the bags are stacked. The pallets or squares shall be made preferably of hard and well-seasoned timber, and shall not have such cracks in which insects may hide. The rails or the pallets or the squares shall be laid parallel to one another, and shall not be more than 15 cm apart. Before laying the dunnage, it shall be brushed clean.

Note — Pallets shall consist of rectangular platforms (like duckboards) made by nailing narrow timber battens on the upper edge of, and at right angles to, wider battens. They shall be of suitable size so as to enable easy handling. (A size of the order of 2·5 m long and 1·5 m broad, with 3 cm space in between transverse battens, is often considered convenient.)

3.4.1.1 The stack shall be stable. There shall be at least 75 cm clear space all round the stack. Deleterious substances shall not be placed in the vicinity of the stack.

3.4.1.2 If leak-proof roofed place for storage is not available, the stacks shall be covered with sound, clean and dry waterproof tarpaulins of suitable size in such a manner that no part of the stack is exposed to rain. The loose edges of the tarpaulins covering the sides of the stack shall be well spread out on the ground abutting the stack and not tucked under the stack. In the event of rain, it shall be ascertained that no water reaches the bags.

3.4.2 *Wagon* — Wagon shall be of the closed type and shall be sound, leak-proof and without any structural defect. A wagon falling in any one of the following categories shall not be used for transport of bags:

a) Wagon having damaged floor, sides or roof, or otherwise structurally defective;

b) Wagon having defective doors, or having such doors which do not close properly, or which are not close fitting; and

c) Wagon having traces of deleterious contaminations, such as coal, sand, cement, mineral oils, chemicals, bone meal, or some other deleterious material or commodity.

3.4.2.1 The floor, inner sides including the inside surface of the doors and ceiling of the wagon, shall be scrubbed clean and then sprayed with 0·5 percent malathion emulsion in the manner prescribed in Appendix C.

3.4.3 *Loading of Bags in the Wagon* — Prior to the commencement of loading of bags in a wagon, its interior shall be thoroughly cleaned. If the spillages are perfectly clean, they shall be bagged and put in the same consignment; if the spillages get dirty, they shall be treated as sweepings and dealt with in the manner given under **3.3.2.2**.

3.4.3.1 *Stacking of bags in the wagon* — The bags shall be stacked in the wagon according to a stack plan avoiding bays and lop-sided heaping and also ensuring compact and balanced stacking so as to make the bags least susceptible to movements and jerks due to either movement or shunting of the wagon. Care shall also be taken that at least 30 cm clear space is left between the doors and the stack. Some buffer in the form of dummy bags filled with hay, husk or *BHOOSA*, shall also be provided at the door. As far as possible, no other commodity shall be placed in the wagon containing bags of AGPI. If, however, plenty of room is available in the wagon and some other commodities are to be placed, these commodities shall be only those which are not likely to have any deleterious effect on the AGPI.

3.4.3.2 Immediately after loading of the wagon is completed, the wagon shall be closed and sealed.

3.4.4 *Label for the Wagon* — After sealing the wagon a label bearing the following information shall be fixed to the wagon:

a) Wagon number,
b) Date of despatch,
c) Kind of AGPI,
d) Number of bags,
e) Average weight of a bag,
f) Total weight of the bags,
g) Despatching station,
h) Receiving station,
j) Address of the consigner, and
k) Address of the consignee.

3.4.5 *Midway Trans-shipment of Bags* — In the event of midway trans-shipment of bags from the original wagon, necessitated by damage to the original wagon, change of railway gauge, or any other reason, the bags of the original wagon, as far as possible, shall be loaded straightaway. If trans-shipment of the bags from the original wagon to the transferee wagon is not possible and the bags have to be unavoidably unloaded from the original wagon, the unloading of the bags shall be done in the manner given under **3.4.5.1**.

3.4.5.1 *Unloading of the bags* — Before the commencement of unloading of bags from the wagon, sound, clean and dry sheets of suitable size shall be spread on the floor all along the passage from the wagon to the unloading point and also just below the door of the wagon so that all spillages of food grain while unloading the bags fall on the sheets and not on the ground. If the spillages are perfectly clean, they shall be bagged and put in the same consignment; if the spillages get dirty, they shall be treated as sweepings and dealt with in the manner given under **3.3.2.2**.

3.4.5.2 *Storage of bags at trans-shipment station* — The unloaded bags at the trans-shipment station shall be stored according to the conditions prescribed under **3.4.1**, **3.4.1.1** and **3.4.1.2**.

3.4.5.3 *Loading of bags in the transferee wagon* — At the time of reloading the bags into the transferee wagon, the provisions given under **3.4.3**, **3.4.3.1** and **3.4.3.2** shall be observed.

3.4.6 *Care During Movement of Wagon* — At all intermediate stations en route, the railway authorities shall provide adequate watch and ward arrangements for the safety of the wagon so that no tampering of the wagon or its seal, or pilferage of AGPI takes place.

3.4.7 *Inspection of Seal of the Wagon at the Receiving Station* — On arrival of the wagon at the destination, the seal of the wagon shall be examined and, if broken, necessary record shall be maintained by the railway authorities.

3.4.8 *Checking of Contents of the Label of the Wagon* — The contents of the label of the wagon (*see* **3.4.4**) shall be checked by the railway authorities at the destination and necessary record maintained by them.

3.4.9 *Unloading of Bags at the Receiving Station* — At the time of unloading the bags from the wagon, the provisions given under **3.4.5.1** shall be observed.

3.4.10 *Storage of Bags at the Receiving Station* — The bags shall be stored at the receiving station according to the conditions given under **3.4.1**, **3.4.1.1** and **3.4.1.2**.

3.5 Transport of Bags by Country or Steam Boat

3.5.1 *Acceptance of Bags for Transport by Boat Authorities at Despatching Jetty* — The boat service authorities at the despatching jetty shall give priority to the work of despatching of bags.

3.5.2 *Storage of Bags at Despatching Jetty* — The provisions given under **3.4.1**, **3.4.1.1** and **3.4.1.2** shall be observed.

3.5.3 *Place in the Boat for Stacking of Bags* — If the boat has got a hold, it shall be ascertained that the hold is leak-proof and dry and also that it does not contain any traces of deleterious contamination. The floor and sides of the hold, and also the planks used for covering the hold, shall be scrubbed clean and sprayed with 0·5 percent malathion emulsion in the manner prescribed in Appendix C, every time a fresh cargo of bags is loaded in the hold.

3.5.3.1 If there is no hold in the boat and the bags have to be stacked on deck, the deck space to be used for stacking shall be well inside the boat away from the edge of the boat so that in ordinary weather splash of water does not reach the bags. The deck shall have a sound, dry, leak-proof and smooth floor and shall not contain any traces of deleterious contamination. It shall be scrubbed clean and treated with a suitable pesticide in the manner prescribed in Appendix C, every time a fresh cargo of bags is placed on it.

3.5.4 *Loading of Bags in the Boat* — The boat shall not carry more cargo than its certified capacity.

3.5.4.1 Prior to the commencement of loading of bags in a boat, sound, clean and dry waterproof sheets of suitable size shall be spread on the jetty all along the passage from the loading point to the jetty and all along the passage from the boat and touching the jetty to the place for stacking of bags, so that all spillages of food grain during loading of bags fall on the sheets and not on the jetty or in the boat. If the spillages are clean, they shall be bagged and put in the same cargo; if the spillages get dirty they shall be treated as sweepings and dealt with in the manner given under **3.3.2.2**.

3.5.4.2 *Stacking of bags in the boat* — The bags shall be stacked in the hold or on the deck according to a stack plan, avoiding bays and lop-sided heaping and also ensuring compact and balanced stacking so as to make the bags least susceptible to movements of the boat.

3.5.4.3 If the bags are stacked on the deck, sound, clean and dry waterproof tarpaulins of suitable sizes shall be spread over the stack in such a manner that no part of the stack is exposed to rain or splashes of water. The loose edges of the tarpaulins covering the sides of the stack shall be well spread out on the floor abutting the stack and not tucked under the stack. A 75-cm clear space shall be left all round the stack. Deleterious substances shall not be placed in the vicinity of the stack.

3.5.5 *Label for Cargo*

3.5.5.1 Each cargo of bags shall have a label bearing the following information:

a) Name of the boat,
b) Date of despatch,
c) Kind of AGPI,
d) Total number of bags,
e) Average weight of a bag,
f) Total weight of the bags,
g) Despatching jetty,
h) Address of the consigner, and
j) Address of the consignee.

3.5.6 *Care During Voyage of the Boat* — Proper care shall be taken by the crew of the boat during the voyage of the boat so that the bags are not damaged en route, particularly by water.

3.5.7 *Checking of Contents of the Label for the Cargo of Bags at the Receiving Jetty* — The contents of the label for the cargo of the boat (*see* **3.5.5**) shall be checked by the boat service authorities at the receiving jetty and necessary record maintained by them.

3.5.8 *Unloading of Bags at the Receiving Jetty* — Prior to the commencement of unloading of the bags at the receiving jetty, sound, clean and dry waterproof sheets of suitable size shall be spread on the boat all along the passage from the unloading point to the boat end touching the jetty and also from the jetty to the unloading point so that all spillages of AGPI during unloading of the bags fall on the sheets and not on the boat or the jetty. If the spillages are perfectly clean, they shall be bagged and put in the same cargo; if the spillages get dirty, they shall be treated as sweepings, and dealt with in the manner given under **3.4.5.2**.

3.5.9 *Storage of Bags at the Receiving Jetty* — The bags shall be stored at the receiving jetty in the manner given under **3.4.1**, **3.4.1.1** and **3.4.1.2**.

4. METHOD OF STORAGE

4.1 AGPI shall be stored either in bags or in bulk. While the modern bag storage facilities may protect commodities from rodents and dampness, they are not bird- and insect-proof. Moreover, in these efficient fumigation may not be possible without special care. It is, therefore, recommended that, wherever possible, AGPI may be stored in bulk, which is economical in space and storage may be possible for periods from 5 to 10 years with ease of fumigation and mechanization of handling operations. However, certain AGPI like rice, sugar, certain oilseeds, pesticides and fertilizers are not recommended for bulk storage, since they suffer loss in quality.

4.2 Bag storage structures like those recommended in IS : 607-1971* and bulk storage structures like steel or aluminium bins (*see* IS : 631-1961†) for farmers' storage and hexagonal concrete-cum-masonry bins (*see* IS : 3453-1966‡) silos (*see* IS : 5503-1969§) and flat storage structures (*see* IS : 5826-1970|| and IS : 6201-1971¶) for trade and government purposes are suitable for scientific storage.

5. RECEIPT OF AGPI FOR STORAGE

5.1 At the time of receipt, AGPI carriers like trucks, wagons or carts shall be carefully inspected for damp and infested AGPI.

5.2 Wagon or truck dumps receiving grain for storage should be provided with suitable sieves to separate hay, stones, etc.

5.3 Temporary sheds and weighing scales receiving bags or loose grain for storage should be cleaned prior to receipt of AGPI.

5.4 Wagon or truck dumps, temporary sheds and weighing scale should be provided protection against rain.

5.5 Pesticides and fertilizers should not be transported along with agricultural produce and inputs, since it involves serious risk of contamination. The conveyances used for transportation of pesticides or fertilizers shall not be used for transportation of agricultural produce meant for human consumption.

6. CARE PRIOR TO BAG STORAGE

6.1 Bag Storage

6.1.1 *Bags* — Bags used for storage shall be either new or sound second

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*Code of practice for construction of bagged food grain storage structures (*second revision*).

†Specification for aluminium food grain storage bins.

‡Code of practice for construction of hexagonal type concrete-cum-masonry bins for bulk storage of food grains.

§General requirements for silos for grain storage.

||Constructional requirements for flat storage structures for grains (capacity above 200 tonnes).

¶Constructional requirements for flat storage structures for grains (100-200 tonne capacity).

hand bags. As far as possible, B-twill bags shall be employed for food grains. However, A-twill bags (*see* IS : 1943-1964*) shall be used for sugar. The bags used for pesticides shall be lined with suitable material to make them leak and moistureproof. The bags used for fertilizers shall be as recommended in IS : 5985-1971†.

6.1.1.1 After filling the bags, the mouth of each bag shall be hand stitched or machine stitched with at least 14 stitches in each line.

6.1.1.2 If sound second-hand bags are used, they shall be treated by the method prescribed in Apprendix B, before filling them with AGPI.

6.2 Examination and Segregation of Damaged Bags or Bags Containing Damaged AGPI — All bags, prior to storage, shall be examined, and such of the damaged bags or those containing damaged AGPI as given below, shall be segregated:

a) Bags which are cut, torn, slack or have deleterious contaminations; and

b) Bags which contain AGPI either damaged due to insect infestation, moisture, dampness or having deleterious refractions or contamination.

6.3 Damaged Bags — The damaged bags [*see* **6.2** (a)] shall be dealt with in the manner given under **6.3.1** and **6.3.2**.

6.3.1 Bags damaged due to moisture, fungus or deleterious contaminations, or those unduly damaged or cut shall be discarded and replaced.

6.3.2 Slack bags shall be made up to the average weight of bags of the lot.

6.4 Damaged AGPI — Bags containing damaged AGPI [*see* **6.2** (b)] shall be dealt with in the manner given under **6.4.1** to **6.4.5**.

6.4.1 *Insect-Infested AGPI* — Bags containing insect infested AGPI shall be fumigated by the method prescribed in Appendix B.

6.4.2 *Moist AGPI* — If the moisture content exceeds the level given in Table 2, AGPI shall be treated to safe moisture level.

6.4.2.1 Drying of AGPI may be done either in the sun or by means of mechanical driers. However, rice shall not be dried in the sun.

6.4.3 *Heated AGPI* — If the AGPI feels hot on the palm of hand, but no cake formation has set in, it shall be aerated by spreading in layers not exceeding 2·5 cm in thickness on a smooth plastered, dry and clean floor inside the BGSS. In no case shall heated AGPI be exposed to the sun.

6.4.4 *Fungus-Attacked, Caky or Sprouting AGPI* — Such AGPI shall be disposed of for animal feed or industrial use, as the case may be.

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*Specification for A-twill jute bags (*revised*).

†Code of practice for handling and storage of bagged fertilizers.

TABLE 2 SAFE LIMITS OF MOISTURE CONTENT FOR STORAGE OF AGRICULTURAL PRODUCE

(*Clauses* 6.4.2 *and* 8.1.2)

SL No.	COMMODITY	MOISTURE, PERCENT
(1)	(2)	(3)
	Cereals and Millets	
1)	Paddy	14
2)	Raw rice	14
3)	Boiled rice	14
4)	Wheat	12
5)	*JOWAR*	12
6)	Maize	12
7)	Barley	12
8)	*RAGI*	12
9)	*BAJRA*	12
	Pulses	
10)	Pulses (whole)	12
11)	Pulses (broken)	12
12)	Gram *KABULI*	12
13)	Gram *DESI*	12
	Milled Products and Bran	
14)	Wheat *ATTA*	12·5
15)	*MAIDA*	12·5
16)	*BESAN*	12·5
17)	*RAVA or SUJI*	13·5
18)	Rice bran	10·0
19)	Maize bran	10·0
	Spices and Narcotics	
20)	Turmeric	12·0
21)	Coriander	10·0
22)	Black pepper	10·0
23)	Chillies	10·0
24)	Cumin seed	10·0
25)	Fenugreek (whole)	10·0
26)	Fennel seed	11·0

(*Continued*)

TABLE 2 SAFE LIMITS OF MOISTURE CONTENT FOR STORAGE OF AGRICULTURAL PRODUCE — *Contd*

SL NO.	COMMODITY	MOISTURE, PERCENT
(1)	(2)	(3)
27)	Coffee	9·0
28)	Tobacco	10
29)	Cloves	12·0
	Oil Seeds and Cakes	
30)	Groundnut pods	6-7
31)	Mustard	7
32)	Milling copra	5-8
33)	Decarticated groundnut oilcake	8-10
34)	Groundnut oilcake	10
35)	Mustard oilcake	10
36)	Cottonseed oilcake	10
37)	Coconut oilcake	10
38)	Sesamum oilcake	10
39)	Linseed oilcake	10
40)	Castor seed oilcake	8
	Root Crops and Starch	
41)	Arrowroot	13·0
42)	Edible tapioca	13·0
43)	Sago (*SABOODANA*)	12·0

6.4.5 *AGPI Containing Deleterious Refractions or Contaminants* — AGPI contaminated with pesticide shall be either disposed of for industrial purpose (conversion to inedible products) or dumped in manure pits. Contaminants like fertilizers and coal shall be suitably removed before AGPI is used for human or animal consumption.

6.5 Preparation of BGSS — Before storage of AGPI, disinfestation of vacant BGSS as suggested in **13** of IS : 609-1955* shall be done.

6.6 Capacity of BGSS — In order to avoid overloading of storage space, the capacity of a BGSS shall be approximately estimated as given in **6.6.1**, **6.6.1.1** and **6.6.1.2**.

6.6.1 The capacity of the BGSS shall be roughly estimated at the rate of 10 bags (each bag weighing approximately 93·2 to 102·6 kg) per 0·6 m^2 if stacked 15 bags high, 10 bags per 0·65 m^2 if stacked 12 bags high, and 10 bags for 0·7 m^2 if stacked 10 bags high.

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*Code of practice for improvement of existing structures used or intended to be used for food grain storage.

6.6.1.1 While estimating the height of the stacks, care shall be taken to see that a minimum of 2 m clear space is left between the top surface of the stack and the inside surface of the roof (or ceiling).

6.6.1.2 The maximum height to which the bags of AGPI may be placed in a stack depends upon the load bearing capacity of floor, nature of commodity, strength of container, etc. However, for practical purpose, the maximum general height of stacks for different AGPI shall not exceed the limits given below:

AGPI	*Maximum General Stack Height (Bags)*	*Approximate Height in Metres*
Sugar (packed in A-twill bags)	24	6
Turmeric	18	4·5
Wheat, maize, barley, paddy, oats, grain and other unmilled whole pulses, sorghum, other millets, oilseeds, oilcakes, and coffee seeds	16	4
Spices, cotton bales, groundnut, and rice, rice bran, and milled pulses	14	3·5
Wheat flour, gram flour, semolina, broken pulses, other milled products, cashew nut kernels, fertilizers, and pesticides	12	3
Tamarind and jaggery chips in bags	6	1·5
Jaggery lumps	—	1 to 1·5

6.6.1.3 *Stack space* — Depending upon the capacity of the BGSS, and size of fumigation cover available, the floor area shall be marked into a number of rectangular or square stack spaces. Care shall be taken to leave alleyways of 75 cm minimum width between the stacks and walls and also in between the stacks. The width of the alleyways in front of door opening should be 150 cm. The length and breadth of a stack shall be not more than 9 m and 6 m respectively.

6.7 Dunnage — Dunnage comprising either timber pallets, timber squares, mattings or a layer of polythene sheet sandwitched between 2 layers of mattings shall be laid on each stack space. The pallets or squares shall be made preferably of hard and well-seasoned timber and shall be free from any cracks which may harbour insects. They shall be laid parallel to each other and shall be not more than 15 cm apart. Before laying the dunnage it shall be brushed clean.

6.7.1 Squares shall be exactly equal to either the length or the breadth of the stack space.

6.7.2 In absence of timber pallets or square, 2 to 3 layers of mattings or a layer of polythene sheet sandwitched between two layers of bamboo matting shall be used.

6.7.3 After laying the dunnage, the floor space between them as well as the dunnage itself shall be sprayed with 0·5 percent malathion emulsion by the method prescribed in Appendix B.

6.8 Stacking of Bags

6.8.1 *Bags* — All bags in a given stack shall be of uniform size and weight.

6.8.2 *Building of Stack* — The stack shall be built over the dunnage as laid on the stack spaces.

6.8.2.1 The stack shall be so built that when completed, it is stable and perfectly cuboid in shape and also that all peripheral bags on the faces of the stack are in one plane without any face of the stack bulging outward or inward at any point.

6.8.2.2 Care shall be taken to see that the stitched mouth of the bags shall not face the peripheral side of the stack.

6.8.2.3 After the completion of a stack, it shall be sprayed with 0·5 percent malathion emulsion by the method prescribed in Appendix B.

6.8.3 All spillages during building of a stack shall be collected and separately dealt with as sweepings in the manner given under **6.8.3.1** and not thrown over or placed in the stack.

6.8.3.1 *Sweepings* — Sweepings shall be dealt with as given in **3.3.2.2.**

7. CARE DURING BAG STORAGE

7.1 Cleanliness Inside BGSS — The inside of the BGSS shall be kept thoroughly clean, and sweepings collected from time to time shall be dealt with as given under **6.8.3.1.**

7.1.1 *Accessories for Storage* — Empty bags, tarpaulins, dunnage and such other accessories, not in use shall also be treated for disinfestation purposes, where there is little likelihood of their becoming infested. They shall be treated by the method prescribed in Appendix B.

7.1.1.1 Empty second-hand gunny bags shall be made up in rolls of 20 bags each and stored at one place. As and when necessity arises, empty second-hand gunny bags shall be treated by the method prescribed in Appendix B.

7.2 Fertilizers or pesticides shall not be stored along with agricultural produce.

7.2.1 Each stack shall contain produce of one type only.

7.3 Periodical Inspection and Treatment of Stacks — Each stack shall be inspected at least once in two weeks to check the condition of AGPI. Agricultural produce may be inspected for any increase in moisture content and temperature, and damage by pests. Pesticides and fertilizers may be inspected for ingress of moisture and increase in temperature. A list of principal major and minor insects of stored agricultural produce with their scientific and common names and distinguishing characteristics and nature of damage caused by them is given in Appendix A.

7.3.1 Draw a sample of 500 g (250 g from top and 250 g from four sides) from 40 to 50 bags taken at random from each stack of 1 000 bags. In this composite sample look for insect infestation of major and minor insect pests and excess moisture.

7.3.1.1 *Classification of infestation* — The insect infestation shall be classified as negligible, moderate or heavy depending upon number of major and minor pests found in the sample of 500 g. The stack having moderate infestation shall be fumigated by the method prescribed in Appendix B.

7.3.1.2 If rats are observed doing damage, their points of entry in the BGSS shall be checked up and necessary measures to protect their ingress as given in IS : 609-1955*, adopted. In addition, poison baiting by the method prescribed in Appendix D of this standard shall be taken recourse to inside the BGSS.

7.3.1.3 If it is observed that damage is being caused by dampness due either to seepage of water from the floor or from the walls of the BGSS or due to leakage of rain-water, the source of dampness or rain shall be removed by adopting necessary measures for protection against ingress of dampness or rain as given in IS : 609-1955*. Also the stack shall be broken and the damaged AGPI segregated and undamaged AGPI salvaged.

7.3.2 Each stack shall be periodically treated by the method prescribed in Appendix B.

7.3.3 All cut bags in the stacks shall be either suitably repaired or replaced.

7.3.4 Each stack shall bear a tally card giving details of date of receipt; origin; kind of AGPI; number of bags and average weight of each bag; nature of dunnage provided; date of despatch; date of inspection; condition of grain and nature of infestation; category of infestation; treatment, if any; and signature and remarks of the inspector.

7.3.5 It is recommended that an AGPI storage warehouse sanitation check list as prescribed in Appendix E shall be maintained at all warehouses. This shall assist inspectors in maintaining cleanliness in warehouses and carrying out timely operations.

7.3.6 Special care involved in storage of various AGPI shall be as laid down in Part III of this standard.

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*Code of practice for improvement of existing structures used or intended to be used for food grain storage.

8. CARE PRIOR TO BULK STORAGE

8.1 Examination and Segregation of Damaged AGPI — AGPI prior to storage shall be examined for damage due to moisture, insect pests, etc, or deleterious refractions and contamination, and shall be segregated.

8.1.1 AGPI damaged with insect pests, rodents, moisture, etc, shall be dealt with in the manner given in **6.4.1** and **6.4.2**. AGPI containing deleterious refractions or contaminants shall be dealt with in the manner prescribed under **6.4.5**.

8.1.2 It shall be ascertained before filling in AGPI that the moisture content does not exceed the moisture levels given in Table 2.

8.2 Preparation of BKSS

8.2.1 Before filling in the AGPI, the BKSS shall be thoroughly cleaned and disinfested as given in **13** of IS : 609-1955*.

8.2.2 Prior to filling in AGPI, the temperature sensory devices, fumigation system, air controlling accessories and other openings, if provided inside a BKSS, shall be thoroughly checked and repaired, if necessary.

8.3 Filling of AGPI in BKSS

8.3.1 AGPI shall be filled in a BKSS taking care to leave about 30 cm from the ceiling, irrespective of the type of structure. While loading AGPI, some of the covers on opening of the roof should be removed as an escape for trapped air.

8.3.2 All spillages during the filling of the food grain in the BKSS shall be collected and separately dealt with as sweepings in the manner given under **6.8.3.1** and never allowed to be mixed up with the bulk of food grain.

9. CARE DURING BULK STORAGE

9.1 Inspection and Treatment — AGPI in BKSS shall be regularly inspected at monthly intervals.

9.1.1 *Opening of BKSS* — In case the AGPI is previously treated, all the openings of the BKSS above the level of the AGPI mass stored inside shall be thrown open. These openings shall be kept open for a period of about 12 hours, during which period, nobody shall be allowed to approach them, unless wearing a mask.

9.1.2 After the openings have thus been kept open for about 12 hours, samples of the stored AGPI shall be drawn from 10 different points within the grain mass as far removed from one another as practicable. These samples shall be drawn with the help of a bulk sampling tube. The sampling tube shall be of sufficient length so as to be able to reach the bottom of the stored AGPI mass. Each sample shall be examined separately for:

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*Code of practice for improvement of existing structures used or intended to be used for food grain storage.

a) moisture content,
b) ' heating ',
c) fungus attack and cake formation, and
d) insect infestation.

9.2 Classification of Infestation — Classification of AGPI for insect infestation shall be done as given in **6.4.1** [*see* IS : 6151 (Part I)-1971*]. In case of infestation demands treatment the structure shall be closed and the AGPI shall be fumigated as given in **9.3**.

9.3 Fumigation — Requisite quantity of EDCT at the rate of 35 kg per 100 cubic metres of space for 5 days depending upon the degree of infestation may be used. However, EDCT is not recommended for fumigation of milled products, oilseeds and spices.

9.3.1 Methyl bromide at the rate of 1·5 to 2·5 kg per 100 m^3 for 24 hours or aluminium phosphide in the form of tablets at the rate of 2 tablets (3 g each) per tonne of commodities for one week may also be used in place of EDCT. These fumigants may be applied to any commodity. In case of godown fumigation, the dosage shall be one tablet per 15 m^3.

9.3.2 Care shall be taken to make the BKSS as airtight as possible.

9.3.3 A placard of suitable size depicting prominently the following minimum cautionary notice shall be fixed to the BKSS:

' DANGER — UNDER FUMIGATION '

9.3.4 After the above period of exposure the commodity shall be degassed for about 12 hours and nobody shall be allowed to approach the structure (*see* **9.1.1**).

9.4 Aeration — If the commodity shows signs of heating, it shall be dealt with in the manner specified in **6.4.3** or by the aeration arrangement provided in the BKSS.

9.5 In case the commodity has become moist, it shall be dealt with in the manner specified in **6.4.2**.

9.6 In case the commodity has been attacked by fungus or becomes caky it shall be dealt with in the manner given under **6.4.4**.

10. ISSUE OF AGPI

10.1 At the time of issue of bags, the most important criterion in determining priority of issue, irrespective of the fact whether AGPI was received earlier or later, shall be the extent of damage to the AGPI. To illustrate: AGPI which is most damaged shall be issued first while the least damaged or sound AGPI issued last. Also small lots of AGPI left over from larger lots after earlier issues shall be given priority in issue.

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*Storage management code: Part I Terminology.

10.1.1 The stack shall be so broken as to cause least disturbance to bags. After taking out the bags to be delivered the stack shall be properly rebuilt.

10.2 Since, at times, damage to AGPI due to dampness placed in the interior of the stack is not readily discerned during storage. The damaged AGPI shall be dealt with as given under **6.4.2**, **6.4.3** and **6.4.4** as the case may demand, shall be observed at the time of issue also.

10.3 After issue of food grain, the BGSS and BKSS shall be thoroughly cleaned and disinfested, as given under **13** of IS : 609-1955*.

11. SAFETY PRECAUTIONS

11.1 Suitable provisions of first-aid supplies and equipment shall be made to safeguard against any accidental exposure to pesticides.

APPENDIX A

(*Clauses* 0.3.1 *and* 7.3)

INSECT PESTS OF STORED AGRICULTURAL COMMODITIES

A-0. GENERAL

A-0.1 Amongst the insect pests of stored agricultural commodities, there are 12 species which are of importance. These are *Sitophilus oryza* L. (the rice weevil), *Rhizopertha dominica* F. (the borer beetle), *Trogoderma granaria* E. (the khapra beetle), *Sitotroga cerealella* Oliv. (the grain moth), *Corcyra cephalonica* Staint. (the rice moth), *Plodia* spp. (the meal moths), *Cadra cautella* (the diamond moth), *Bruchus* spp. (the pulse beetles), *Tribolium castaneum* Herbst. (the red rust flour beetle), *Laetheticus oryzae* Waterhouse (the long headed flour beetle), *Oryzaephilus surinamensis* Linn. (the saw toothed grain beetle), and *Laemophloeus minutus* Oliv. (the flat grain beetle). Out of these twelve species of insects, the first eight are called primary pests, because they are capable of damaging all kinds of stored food grain, while the last four are incapable of damaging whole sound grain, and they either follow the attack of primary pests or infest already broken or milled food grain. These latter four are, therefore, called secondary pests. A brief description of the habits and life history of these insects is given in the following clauses.

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*Code of practice for improvement of existing structures used or intended to be used for food grain storage.

A-1. *SITOPHILUS ORYZA* L. (ORDER COLEOPTERA, FAMILY CURCULIONIDAE.)

A-1.1 This pest (*see* Fig. 1) is popularly known as the rice weevil. It is a small chocolate-coloured or dark brown beetle about 3·5 mm long with its head prolonged into a long cylindrical snout or proboscis. The dorsal surface of the weevil is characterized by being marked with four light reddish or yellowish spots. The weevil attacks all kinds of cereals. Both the adults and the larvae are voracious feeders. The female weevil bores small cavities on the surface of the food grain and lays the eggs in these cavities. Only one egg is laid in each cavity. A single female is capable of laying about 300 to 400 eggs. The incubation period for eggs is about 3 to 6 days. The tiny larva, after emergence from the egg, directly bores its way into the food grain and makes a cavity inside the kernel in which it passes the rest of its life. As the larva feeds on the kernel within the cavity, the cavity enlarges. The larval stage lasts for about 20 to 30 days, after which the larva pupates inside the cavity itself. The pupal period lasts from 3 to 6 days. The adult weevils live up to 6 months and cause damage by feeding on grains.

A-2. *RHIZOPERTHA DOMINICA* F. (ORDER COLEOPTERA, FAMILY BOSTRYCHIDAE.)

A-2.1 This pest (*see* Fig. 2) is known in India as the borer beetle. In some of the overseas countries, it is, erroneously, also called as the lesser grain borer, though it causes very serious destruction of stored food grain. It is a major pest of all cereals, but at times becomes also a serious pest in milled food grain products, such as flour, *ATTA* and semolina. It is cylindrical in form and comparatively smaller than *Sitophilus oryza* L. (*see* **A-1**). It is dark brown in colour with a punctated dorsal surface. It is characterized by its head deflexed down under the thorax. Both the adults and the larvae are capable of causing enormous destruction, reducing the food grain at times to mere shells, or converting milled food grain products into tangled mass of excreta. The eggs are laid loose in the food grain. A single female is capable of laying about 300 to 500 eggs. The Incubation period for eggs is about 6 to 9 days. Immediately after hatching, the tiny larva starts moving about actively eating broken parts of food grain. After a few days, the larva bores its way inside a grain generally through a point at which the grain has already been damaged by the adults. Having once gone inside the food grain the larva does not come out again. As it feeds on the kernel within the cavity, the cavity enlarges. The larval period lasts from 4 to 8 weeks, and the pupal from 7 to 8 days. The adults live up to 6 months and cause damage.

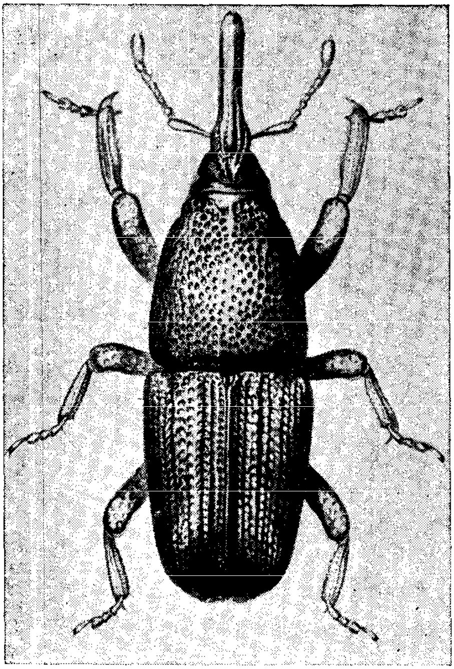

FIG. 1 *SITOPHILUS ORYZA* L.
(Approximate Magnification — 23 Times)

A-3. *TROGODERMA GRANARIA* E. (ORDER COLEOPTERA, FAMILY DERMESTIDAE.)

A-3.1 This pest (*see* Fig. 3) is commonly known as the ' khapra '. This too is a serious pest of all cereals and some times also of pulses. Wheat, however, is its principal food. Unlike *Sitophilus oryza* L. (*see* **A-1**) and *Rhizopertha dominica* (*see* **A-2**) the adult is incapable of causing any damage. It is the larva alone which attacks food grain. The larva is, in fact, so destructive that it almost compensates for the lack of damaging capability of the adult. The adult is about 2·54 mm long and has a characteristic oval shape. The colour of the adult is light chocolate with a glabrous dorsal surface. The female lays its eggs loose, generally in batches of 4 to 6. A single female lays about 80 to 150 eggs. The incubation period for eggs is about 4 to 7 days. The larva is brownish in colour, with characteristic reddish brown tufts of hair on each of its segments. On the posterior-most segment, the tufts of hair are in the form of a tail. The larva has the habit of attacking a large number of food grains instead of restricting its damage to one food grain. It starts

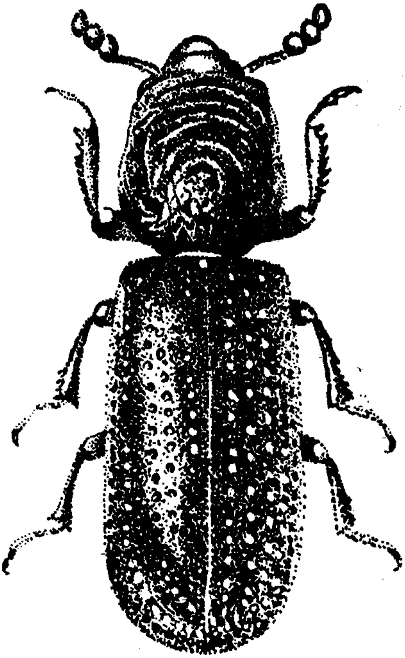

FIG. 2 *RHIZOPERTHA DOMINICA* F.
(Approximate Magnification — 26 Times)

eating from the embryo region. In case of heavy infestation, the food grain is completely hollowed out leaving only the shell. The larval period lasts from 3 to 8 weeks. The larva is a very tenacious creature and has been known to live without food for a number of years. The larva pupates outside the food grain and the pupa lies loose in grain mass. The pupal period lasts from 4 to 6 days. The adults live for a week and do not cause damage.

A-4. *SITOTROGA CEREALELLA* OLIV. (ORDER LEPIDOPTERA, FAMILY GELECHIIDAE.)

A-4.1 This pest (*see* Fig. 4) is commonly known as the grain moth or the Angoumois grain moth. It is chiefly a pest of paddy and maize, but may attack other food grain as well. It is a small hay-coloured moth with a wing spread of 12·7 to 16·9 mm. The margin of fore-wings is fringed with characteristic small hair and these hair are longer than the width of wing membranes. The wing membranes are prolonged at the apical angle like a finger. When the

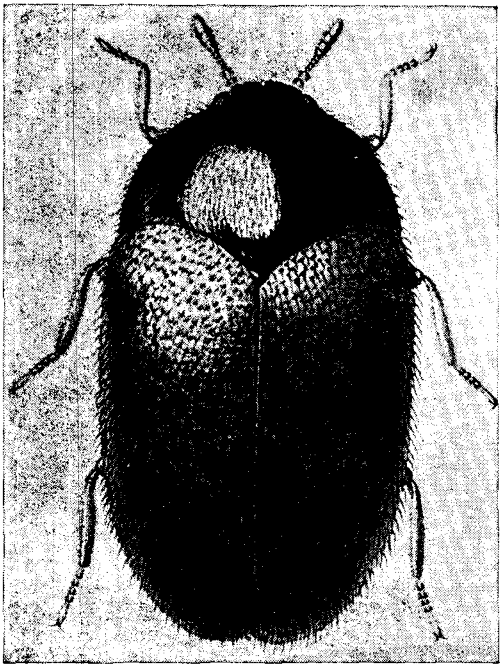

FIG. 3 *TROGODERMA GRANARIA* E.
(Approximate Magnification — 29 Times)

moth is at rest, the wings are folded in a sloping manner (not flat) over the abdomen; the antennae point backwards and are slightly raised above the wings; and the palpi are raised upwards like two horns. A female is capable of laying about 120 to 400 eggs. The eggs are deposited singly or in clusters in depressions or damaged parts of the food grain, or are laid loose in the grain mass. The incubation period for the eggs is about one week. The tiny larva, immediately after emergence, bores into the kernel of the food grain, and forms a cavity there. As it feeds, the cavity inside the food grain enlarges, where the larva finally pupates. Before pupating, the larva bores a circular hole in the food grain leading from the cavity to the outside for the emergence of the adult. The larval period lasts from 2 to 3 weeks, and the pupal period from 5 to 6 days.

A-5. *CORCYRA CEPHALONICA* STAINT. (ORDER LEPIDOPTERA, FAMILY PYRALIDAE.)

A-5.1 This pest (*see* Fig. 5) is commonly known as the rice moth. It is a pest of all cereals, particularly rice, and also at times of pulses. It is a pale

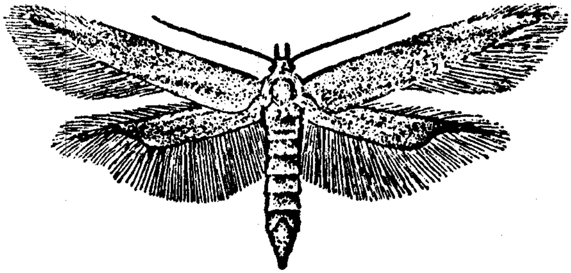

FIG. 4 *SITOTROGA CEREALELLA* OLIV.
(Approximate Magnification — 5 Times)

greyish-brown moth. It is comparatively bigger in size than *Sitotroga cerealella* Oliv. (*see* **A-4**). When the moth is at rest, the wings are folded in a sloping manner over the abdomen like *Sitotroga cerealella* Oliv., but the antennae lie straight (not crossed) on the wings; and the palpi lie close to each other pointing forwards giving the appearance of a closed beak. A single female lays about 90 to 200 eggs. The eggs are laid indiscriminately and loose in the grain mass. The incubation period for eggs is about 4 to 5 days. The tiny larva starts its activity soon after its emergence and moves about actively feeding on food grains. When fully fed, the larva spins a silken cocoon in which it pupates. In the process of spinning the cocoon, the larva also webs along with small pieces of broken food grain with the result that the whole cocoon appears like a webbed mass of food grain. The larval period lasts from 3 to 4 weeks, and the pupal period about 10 days.

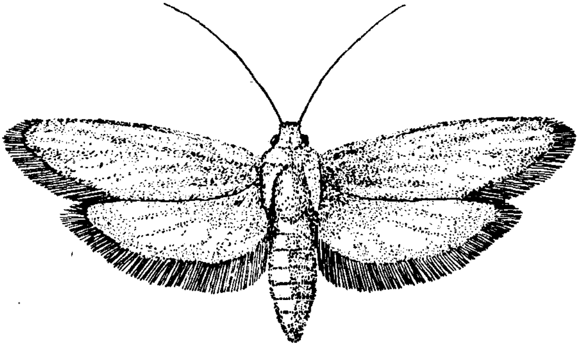

FIG. 5 *CORCYRA CEPHALONICA* STAINT.
(Approximate Magnification — 3 Times)

A-6. *PLODIA* SPP. (ORDER LEPIDOPTERA, FAMILY PYRALIDAE.)

A-6.1 These insects (*see* Fig. 6) are generally called the meal moths. There are a number of species belonging to this genus, but it is still unknown as to which of them are more common in this country. They attack all kinds of food grains. The moths have a wing spread of 12·7 to 19·05 mm. When the moths are at rest, the wings are folded touching each other closely along their posterior margin and lie flat on the abdomen; the antennae lie crossed over the wings; and the palpi lie slightly apart from each other pointing forwards giving the appearance of an open beak. The base of the fore-wings is greyish-white in colour and the top half or two-thirds of the fore-wings as well as the head and the thorax are a contrasting brown. A female lays between 40 to 350 eggs. The eggs are laid loose in the grain mass either singly or in clusters. The incubation period for eggs is generally about 2 weeks. When fully fed, the larva webs a silken cocoon in which it pupates. In case of heavy infestation, webbed sheets are formed by the larvae over the bags and in the grain mass. The larval period is generally about three weeks, but it is known to live under adverse conditions up to two years. The pupal period lasts for about 2 weeks.

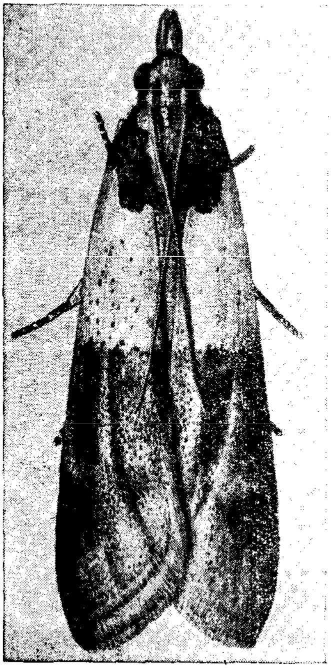

FIG. 6 *PLODIA* SPP.
(Approximate Magnification — 12 Times)

A-7. *CADRA CAUTELLA* WALKER (ORDER LEPIDOPTERA, FAMILY PYRALIDAE.)

A-7.1 They are generally called almond moths (*see* Fig. 7). They attack all kinds of food grain, particularly wheat. The adult moths have a wing spread of about 11 mm. The colour of the moth is pale-grey with the fore-wings marked with dark bands at their anterior margins. When the moth is at rest, the wings lie closely like the *Plodia* spp. (*see* **A-6**). A female generally lays about 200 eggs. The eggs may be laid loose or in the cracks in the storage structure and dunnage. The incubation period for eggs is about 3 to 5 days. The larva after feeding for a few days spins a cocoon, which is in the form of a little tube. It is in this tube that the larva lives and then finally pupates inside the cocoon. The larval period is about 4 to 6 weeks while the pupal period about 1 to 2 weeks.

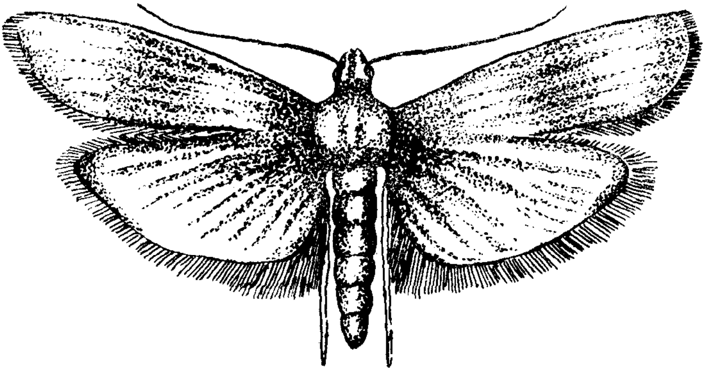

FIG. 7 *CADRA CAUTELLA* WALKER
(Approximate Magnification — 8 Times)

A-8. *TRIBOLIUM CASTANEUM* HERBST. (ORDER COLEOPTERA, FAMILY TENEBRIONIDAE.)

A-8.1 This pest (*see* Fig. 8) is popularly termed as red rust flour beetle or red grain beetle. It is essentially a pest of milled products, such as flour and semolina, but may also be found in food grain which is already infested with primary pests. It is a small reddish-brown flattened beetle, about 3·17 mm in length. The dorsal surface of the beetle has characteristic parallel lines of slightly darker colour. A female is capable of laying 400 to 500 eggs. The eggs are laid loose in the grain mass. The incubation period is about 5 to 12 days. The larval period lasts about 4 weeks, and the pupal period from 6 to 9 days. The adult beetles may live as long as one year.

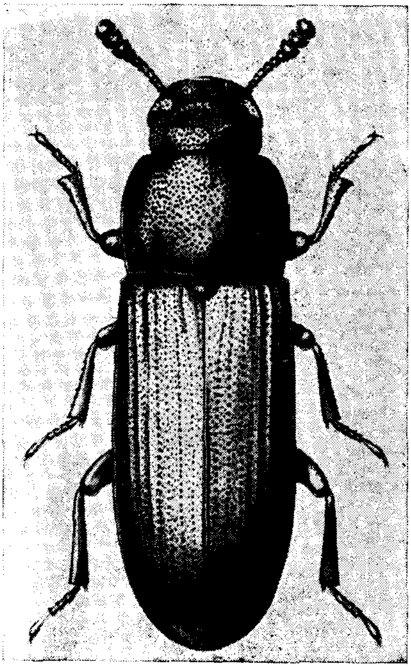

FIG. 8 *TRIBOLIUM CASTANEUM* HERBST.
(Approximate Magnification — 20 Times)

A-9. *LAETHETICUS ORYZAE* WATERHOUSE (ORDER COLEOPTERA, FAMILY TENEBRIONIDAE.)

A-9.1 This pest (*see* Fig. 9) is popularly known as the long-headed flour beetle and is very similar to *Tribolium castaneum* Herbst. (*see* **A-8.1**), except that it is lighter in colour and the dorsal surface is glabrous. It is also comparatively slightly less flattened than *Tribolium castaneum* Herbst. The life history and habits of this beetle are similar to those of *Tribolium castaneum* Herbst.

A-10. *ORYZAEPHILUS SURINAMENSIS* LINN. (ORDER COLEOPTERA, FAMILY CUCUJIDAE.)

A-10.1 This is popularly known as the saw-toothed grain beetle (*see* Fig. 10). It is much smaller in size than *Tribolium castaneum* Herbst, or *Laetheticus oryzae* Waterhouse (*see* **A-8.1** and **A-9.1**). The thorax is characterized by serrations on its dorsal surface, due to which the beetle has acquired its popular name. Its life history and habits are similar to those of *Tribolium castaneum* Herbst.

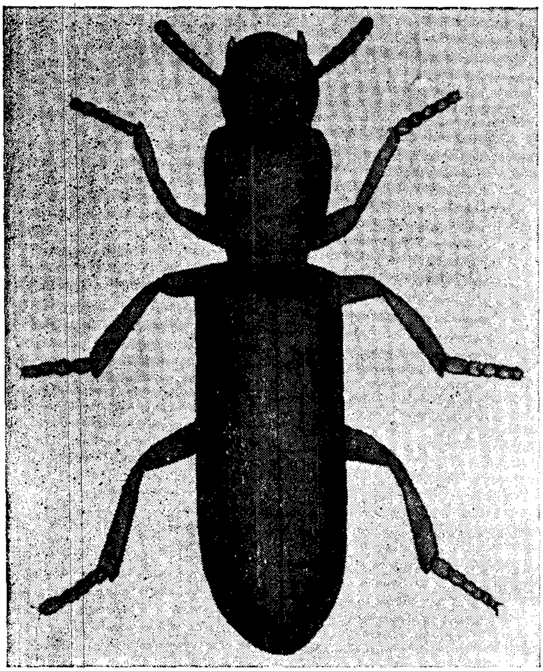

FIG. 9 *LAETHETICUS ORYZAE* WATERHOUSE.
(Approximate Magnification — 23 Times)

A-11. *LAEMOPHLOEUS MINUTUS* OLIV. (ORDER COLEOPTERA, FAMILY CUCUJIDAE.)

A-11.1 This is popularly known as the flat grain beetle (*see* Fig. 11). It is a minute flattened oblong reddish-brown beetle about 1·54 mm long. The antennae are characteristically elongated, about two-thirds of the body, and are very vibratile. This beetle is the smallest amongst almost all the insect pests of stored food grain. The life history and habits are similar to those of *Tribosee lium castaneum* Herbst. (*see* **A-8.1**).

A-12. *BURCHUS* SP. (ORDER COLEOPTERA, FAMILY BRUCHIDAE.)

A-12.1 They are popularly called as pulse beetles (*see* Fig. 12). There are a number of species of this genus which are common in India. These are essentially pests of stored pulses. They are the biggest in size amongst the group of

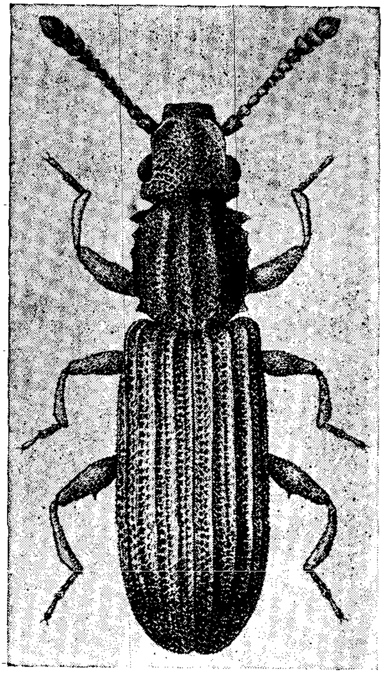

FIG. 10 *ORYZAEPHILUS SURINAMENSIS* LINN.

(Approximate Magnification — 30 Times)

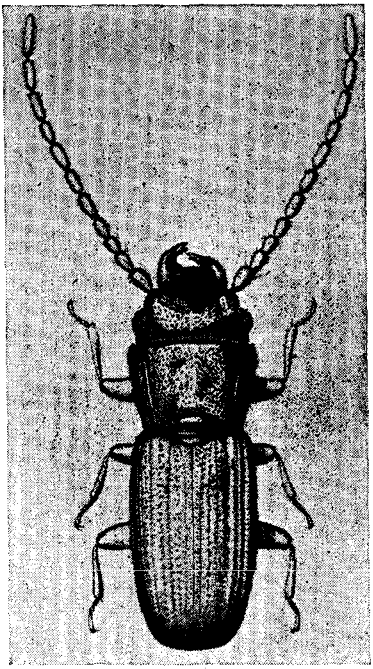

FIG. 11 *LAEMOPHLOEUS MINUTUS* OLIV.

(Approximate Magnification — 36 Times)

all stored food grain pests, with a characteristic globular body. They are about 5·08 mm long and 2·54 mm in diameter. The females glue their eggs to the outside of the pulse grains. About 1 to 12 or even more eggs may be glued on the same grain. The incubation period for the eggs is about a week. The larva on emergence bores directly inside the grain and makes a cavity in the kernel. As the larva feeds in the kernel, the cavity enlarges. Before pupation, the larva cuts a circular hole in the grain leading from the cavity to the outside for the adult to emerge. The larval period lasts from 3 to 5 weeks, and the pupal period from 3 to 6 days.

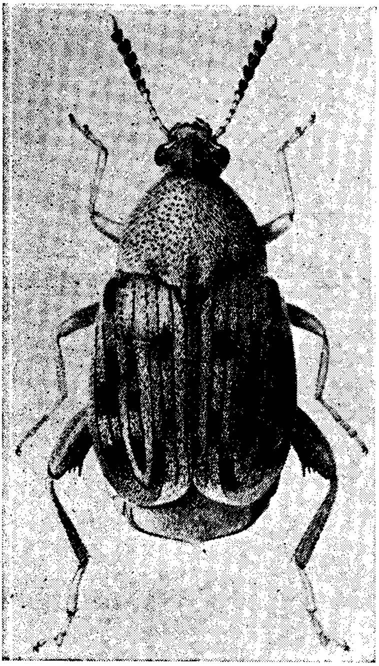

FIG. 12 *BRUCHUS* SPP.
(Approximate Magnification — 16 Times)

APPENDIX B

(*Clauses* 3.1.1.1, 3.2.1.1, 6.1.1.2, 6.4.1, 6.7.3, 6.8.2.3, 7.1.1, 7.1.1.1, 7.3.1.1 *and* 7.3.2)

METHOD FOR TREATMENT OF GUNNY BAGS AND STACKS

B-1. FUMIGATION

B-1.1 Fumigant — The fumigant shall be EDCT or methyl bromide, or aluminium phosphide. For spot fumigation or small scale storage, ethylene dibromide may be used.

B-1.2 Equipment

B-1.2.1 *Gas Mask* (*Canister Respirator*) — Each operator shall be provdied with a suitable gas mask. A gas mask of the type described below is considered suitable:

> A face-piece covering the eyes, nose and mouth, connected to a canister containing absorbent material for the vapours of fumigant, by means of a flexible non-kinking breathing tube and arranged with valves so that all air inhaled by the wearer passes through the canister and the exhausted air passes direct to the surrounding atmosphere through a non-return valve. The canister containing the absorbent material should have a warning indicating the number of hours for which it could be used effectively in an atmosphere charged with the vapours of the fumigant used.

B-1.2.2 *Cans* — Adequate number of empty 9-litre petrol cans or 18-litre jerry cans for keeping the measured quantities of fumigant ready.

B-1.2.3 *Loose-Fitted Cubical Gas-Proof Covers* — A gas-proof cover of suitable dimensions according to the stack size may be stitched out of 3-ply rubberized cloth or any other suitable gas-proof fabric which is sufficiently strong to withstand rough handling in use. In case of a stitched cover, the seams should be painted with some suitable rubber or plastic solution so as to prevent leakage of vapours of the fumigant through the seams. On the top face of the gas-proof cover, there should be a few openings, each 15 cm in diameter, and provided with a leather sleeve 22 cm in length. The joints between the sleeves and the cover should be so made as to prevent any leakage of the vapours of EDCT through them.

B-1.2.4 *Mud Plaster* — Mud plaster shall not contain sand and shall be devoid of lumps, dry earth, stones, etc.

B-1.2.5 *Ladder* — of adequate length so as to reach the top of the stack.

B-1.2.6 *Galvanized Iron Drum* — about 35 cm in height and 20 cm in diameter, with airtight seams and airtight lid. (Such a drum may conveniently hold two rolls of gunnies, each roll having 20 bags.)

B-1.2.7 *Halide Leak Detector*

B-1.3 Precautions

B-1.3.1 Fumigation shall be carried out under the supervision of an experienced and responsible person, with the assistance of well-trained operators.

B-1.3.2 Inhalation of any fumigant or exposure to its vapours without wearing gas mask shall be completely avoided.

B-1.3.3 Care shall be taken not to spill any fumigant while pouring it out in cans or in gas-proof covers.

B-1.4 Procedure

B-1.4.1 *Fumigation of Empty Gunny Bags* — Make rolls of empty gunny bags, each roll containing 20 bags. Place these rolls in the drum (*see* **B-1.2.6**). The quantity of different fumigants required shall be as follows:

EDCT	0·3 kg/m^3
MBR	0·02 kg/m^3
EDB	0·02 kg/m^3
ALP	One tablet (3 g) per 15 m^3.

Take out the required quantity of the fumigant, except MBR, in a clean dry glass bottle. Quickly pour this quantity in the drum containing the rolls of gunnies. Cover with the lid and seal it. The sealing of the lid may be done by either mud plaster or preferably with plasticine. The required dose of MBR should be introduced from the cylinder directly through a rubber or plastic tube. Keep the drum closed for about 48 hours except in case of aluminium phosphide, keep it closed for 5 days, after which remove the lid and keep the drum open for about 6 hours. The rolls may then be taken out. If the number of rolls is sufficiently large and fumigation in drums is found to be tedious, all the rolls may be made into a stack and fumigation carried out under gas-proof covers in the manner given under **B-1.4.2**.

B-1.4.2 *Fumigation of Stack* — Cover the stack with the gas-proof cover (*see* **B-1.2.3**) of a suitable size. Fold the lower edges of the cover inwards and spread the folded edges of the floor to the extent of not less than 15 cm. Plaster the folded edges on to the floor with mud so as to prevent the vapours of fumigant from escaping out from edges. Take out the required quantity of different fumigants (**B-1.4.1**) in petrol cans or jerry cans. Carry the required number of these cans to the top of the stack and pour the fumigant in the cover through the sleeves provided in the top face of cover. Tie the leather sleeves as in the case of a football bladder. Keep the cover closed over the stack for a period of 24 to 48 hours for methyl bromide and 5 days for EDCT, and one week for ALP, after which lift the edges of the cover. Leave the BGSS open for about 6 hours. During this period nobody should be allowed to either enter or remain inside the BGSS. After this period of 6 hours, remove the entire cover from the stack.

B-2. SPRAYING

B-2.1 Material

B-2.1.1 *Malathion Emulsifiable Concentrate* — 50 percent.

B-2.2 Equipment

B-2.2.1 *Sprayer* — A suitable hand compression sprayer, rocker sprayer or power sprayer.

B-2.2.2 *Buckets*

B-2.2.3 *Respirator, Mask and Overalls* — Each operator shall be provided with a suitable respirator, a mask to protect his eyes from the spray, and overalls.

B-2.3 Procedure — Take 10 ml of malathion emulsifiable concentrate (50 percent) for one litre of water to obtain 0·5 percent concentration of the emulsion. Fill the emulsion in the sprayer. Spray the empty bags or stacks with the emulsion.

B-2.4 Precaution — The operators should wash their hands, neck and other parts of the body likely to be exposed after wearing the overalls and the mask prior to spraying as well as after finishing the operation.

B-3. DIPPING OF USED GUNNY BAGS

B-3.1 Used gunny bags shall be disinfested by dipping for 10 minutes in 0·5 percent malathion emulsion prepared by the method given in **B-2.3**.

B-3.1.1 Care shall be taken to dry the bags in the shade.

APPENDIX C

(*Clauses* 3.3.1.3, 3.4.2.1, 3.5.3 *and* 3.5.3.1)

METHOD FOR SPRAYING VEHICLES, BOATS, WALLS, ETC

C-1. MATERIAL

C-1.1 The material used for spraying shall be malathion emulsifiable concentrate (50 percent).

C-2. EQUIPMENT

C-2.1 Sprayer — A suitable sprayer.

C-2.2 Respirator, Mask and Overalls — Each operator shall be provided with a suitable respirator, a mask to protect his eyes, and overalls.

C-3. PROCEDURE

C-3.1 For spraying, select such a time when the weather is calm. For spraying the floor and the sides of the vehicle, park the vehicle in a garage. If a garage is not available, park the vehicle on the leeward side of a high building so that the spray is not blown away by the wind during the operation of spraying. In case of a wagon, keep its door closed during the operation of spraying.

C-3.2 Sweep clean the surface which has to be sprayed. Take 10 ml of malathion emulsifiable concentrate (50 percent) for one litre of water to obtain 0·5 percent emulsion, and work the sprayer in such a manner that its nozzle is at a reasonable distance from the surface to be sprayed, and also that the deposit of the material on the surface is uniform.

C-4. PRECAUTION

C-4.1 The operators should wash their hands, neck and other parts of the body likely to be exposed after wearing the overalls and the mask, prior to spraying as well as after finishing the operation.

APPENDIX D

(*Clause* 7.3.1.2)

METHOD FOR POISON BAITING OF RATS

D-1. GENERAL

D-1.1 Out of the group of rats, which generally attack stored AGPI, the following six species are common in India:

a) *Rattus rattus* (the black rat),
b) *Rattus norvegicus* (the brown rat),
c) *Mus musculus* (the house mouse),
d) *Bandicota bandicota* } (the common bandicoots), and
e) *Bandicota bengalensis* }
f) *Gerbillus* spp. (the common field rat).

D-1.1.1 These species of rats can be distinguished by their various characteristics, but from the point of view of damage to stored AGPI the distinction between the species is immaterial. Rats are very fast breeders. A single female can produce five litters in a year, each litter containing 9 young ones, which begin to breed within a period of two months from their birth. It is estimated that one pair of rats can produce as many as 800 offsprings during the course of one year. Rats not only deprive us of our AGPI by consuming it but also by spoiling the AGPI by nibbling it into brokens, and by contaminating it with their droppings. In bag storage godowns particularly, they are additionally harmful because they cut the bags, with the result that when bags are moved from one place to another or trans-shipped, considerable quantities of AGPI are lost through bleeding of the damaged bags.

D-1.2 Poison baiting is carried out by the use of a bait base and a poison.

D-1.2.1 *Bait Base* — The bait base may comprise the same AGPI as stored in the BGSS, or other foodstuff, such as flour, *ATTA*, gram flour, freshly boiled rice or biscuit meal. There is no universally acceptable bait for all rodents. Proper selection of bait is very essential for good results, which depends upon the season, species to be controlled, other food material available in the place of control and when the control work is undertaken. The bait base, to be used either for preparing poison bait (*see* **D-4**) or for pre-baiting (*see* **D-5.1.1**), shall be freshly moistened and given a touch of raw coconut oil. If unmilled food grain is to be used as bait base, the food grain shall be soaked in water for a few hours till it becomes soft, and then spread out on a piece of gunny in order to remove the free droplets of water.

D-1.2.2 *Poison* — Various poisonous substances are available which may broadly be classified as single dose (acute) or multiple dose (chronic) poisons. A number of poisons fall under these groups but comparatively a few of them are widely used for rodent control work. Following poisons may be used for protection of AGPI from rats.

D-1.2.2.1 *Single-dose poisons* — Zinc phosphide, in the proportion of 2·5 percent by weight to the bait base.

D-1.2.2.2 *Multiple-dose poisons* (*anticoagulants*) — Hydroxy coumarins, namely, warfarin, fumarin, etc.

Anticoagulant poisons cause internal and external haemorrhage when consumed for several days. As the symptoms of poisoning appear only gradually, rats do not feel bait shyness. No pre-baiting is necessary when anticoagulants are used. Commercially, anticoagulants are available in three forms, namely, concentrate; water-soluble compound; and ready-mixed bait. For preparation of baits, one part of 0·5 percent concentrate or 0·5 percent water soluble compounds is to be mixed with 19 parts of bait base or water. Simultaneous use of both dry and liquid baits is more effective when density of rat population is very high. The poison baits containing poison other than zinc phosphide shall be suitably coloured with a warning colour.

D-2. EQUIPMENT

D-2.1 Buckets or Galvanized Iron Drums — of suitable size, according to quantity of the poison bait to be prepared.

D-2.2 Ladles—for taking out the poison bait from the buckets or galvanized iron drums and placing the poison bait (*see* **D-4**) in containers for poison bait (*see* **D-2.3**).

D-2.3 Containers for Poison Bait — Ready made bait trays and cups are also available commercially and may be used. Alternatively, pieces of rejected cans or pipes may be used.

D-2.4 Rubber Gloves — a pair for each operator.

D-3. PRECAUTIONS

D-3.1 The poison (*see* **D-1.2.2**) and the poison bait (*see* **D-4**) shall not be touched with bare hands. The operators shall wash their hands thoroughly with soap and water after handling the poison or poison bait. The poison when not in use shall be kept under lock and key under the supervision of a responsible person. The unused poison bait left over in the evenings or that collected in the mornings from BGSS, shall be buried under the supervision of a responsible person.

D-3.2 Care shall be taken that the poison or poison bait does not contaminate the AGPI. If the AGPI gets contaminated, it shall be destroyed or buried under the supervision of a responsible person.

D-4. PROCEDURE FOR PREPARING BAIT

D-4.1 Weigh out the required quantity of the moistened bait base (*see* **D-1.2.1**) and place it in a bucket or galvanized iron drum (*see* **D-2.1**) of a suitable size so that the bait base does not occupy more than half the capacity of the bucket or drum. Next, weigh out the required quantity of the poison to be used according to the proportion given against each poison under **D-1.2.2**. Sprinkle this quantity of the poison over the moistened bait base kept in the bucket or drum. Thoroughly mix the poison and the bait base.

D-5. PROCEDURE FOR BAITING

D-5.1 Single-Dose Poison

D-5.1.1 *Pre-baiting* — Place, at dusk, about 50 g of bait base (without the poison), in containers (*see* **D-2.3**) in the BGSS at different points near the suspected rat runs. Close and lock the BGSS. Watch the following morning whether the bait base has been eaten during the night by the rats. Remove the containers in the morning and throw away the bait base left in the containers. Repeat this process by placing fresh quantities of the same type of bait base (without the poison) at the same points in the BGSS as on the previous day, for a few successive days till it becomes certain that the rats have started eating the unpoisoned bait base.

D-5.1.2 *Poison Baiting* — When during the process of pre-baiting (*see* **D-5.1.1**), it has been ascertained that rats have started eating the unpoisoned bait base, replace the bait base with freshly prepared poison bait (*see* **D-4**), and continue with the procedure of placing the poison bait in the evenings and removing it the next morning, as given under **D-5.1.1**, for another few days till it is observed that rats no longer eat the poison bait.

D-5.1.3 *Follow-up Treatment* — Follow up the treatment of pre-baiting and baiting cycle in succession (*see* **D-5.1.1** and **D-5.1.2**) after a period of about a week or ten days from the last date of poison baiting, till it is observed that the rat menace in the BGSS has been eradicated. The follow-up treatment shall be done at least twice after the first pre-baiting and baiting cycle given under **D-5.1.1** and **D-5.1.2**.

D-5.2 Multiple-Dose Poisons

D-5.2.1 Small quantity of sugar may also be added to the bait to make it more palatable.

D-5.2.2 In case of dry baits, place the prepared bait or ready-to-use bait in bait cups at various points along the rat runs, at the rate of 200 g per spot. In a small house, one or two placements may be sufficient, whereas in warehouses and industrial establishments, the number of placements depends upon the size of the establishment and severity of rodent damage.

D-5.2.3 Liquid baits should be placed in shallow containers at the rate of 0·25 litre per container. Place the containers along rat runs.

D-5.2.4 Leave the baits as long as possible. Replenish the baits as and when necessary. Due to slow action of anticoagulants, the kill may be obtained only after 8 to 10 days of continuous feeding. Mice may take even 20 days.

D-5.2.5 In order to ensure maximum intake of baits by rats and to safeguard against any hazards, it is recommended that permanent bait stations, in which the bait trays/cups are to be kept, may be fixed. A simple bait station may be used. Poison bait containers may be placed in these stations. The poison bait may also be placed directly in the bait stations made of empty powder cans or earthen pots. Necessary arrangements may be made to firmly fix them.

D-5.3 In the follow-up treatment, it is advantageous to use another bait base and another poison than what has been used previously.

APPENDIX E

(*Clause* 7.3.5)

AGPI STORAGE WAREHOUSE SANITATION CHECK LIST

E-1. WAREHOUSE CONSTRUCTION AND UTILIZATION

E-1.1 Storage capacity————————tonnes————————m^2————————

E-1.2 AGPI in Storage————————————————————————————————

——

E-1.3 Type of Storage: Bulk (flat)————————; Bagged————————
Bag Bulk head————————

E-2. CONDITION OF WAREHOUSE PERIMETER

E-2.1 Railroad tracks:

- (a) Debris present — Yes/No*
- (b) Grain accumulations — Yes/No*

E-2.2 Truck loading docks:

- (a) Debris present — Yes/No*
- (b) Grain accumulations — Yes/No*

E-2.3 Trash piles on grounds or near warehouse Yes/No*

E-2.4 Rodent signs on warehouse grounds Yes/No*

E-2.5 Birds nesting, or roosting under canopies Yes/No*

E-3. MAINTENANCE OF WAREHOUSE EXTERIORS

E-3.1 Canopies in need of repair Yes/No*

E-3.2 Holes in walls through which birds can enter Yes/No*

E-3.3 Holes in walls at floor level giving access to rodents Yes/No*

E-3.4 Doors are not tight fitting to exclude rodents Yes/No*

E-3.5 Broken windows or sky lights Yes/No*

E-3.6 Windows or doors in need of screens Yes/No*

E-3.7 Roof or walls leak when it rains Yes/No*

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*Strike out whichever is not applicable

E-4. MAINTENANCE OF WAREHOUSE INTERIORS

E-4.1 Do floor areas require cleaning Yes/No*

E-4.2 Do walls require cleaning Yes/No*

E-4.3 Do overhead areas require cleaning Yes/No*

E-4.4 Are there cracks in floors or walls which accumulate grain Yes/No*

E-5. AGPI INSPECTION PROCEDURES

E-5.1 Is AGPI sampled and inspected before receiving it in the warehouse:

- a) Moisture is determined Yes/No*
- b) AGPI is graded Yes/No*
- c) AGPI checked for insects Yes/No*
- d) AGPI is checked for evidence of rodents (pellets———) Yes/No*
- e) AGPI is checked for off-odors Yes/No*

E-5.2 Is AGPI in storage routinely inspected:

- a) For moisture (frequency———) Yes/No*
- b) For temperature (frequency———) Yes/No*
- c) For insects (frequency———) Yes/No*

E-5.3 Standards are established for maximum insect and/or rodent evidence Yes/No*

E-5.4 Grain is fumigated if insects noted Yes/No*

E-6. AGPI STORAGE PRACTICES

E-6.1 Bagged AGPI is stored on pallets Yes/No*

E-6.2 Bagged AGPI is stored in orderly fashion Yes/No*

E-6.3 Stacks of bagged AGPI as recommended for different AGPI Yes/No*

E-6.4 Stacks of bagged AGPI are at least 1 metre below overhead structures Yes/No*

E-6.5 Stacks of bagged AGPI are stored at least 75 cm from all walls and at least 75 cm between stacks Yes/No*

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*Strike out whichever is not applicable.

E-6.6 Broken bags of AGPI in stacks *not* noted Yes/No*

E-6.7 Is AGPI cleaned when received Yes/No*

E-7. INSECT CONDITIONS

E-7.1 Moths noted flying in warehouse Yes/No*

E-7.2 Adult insects or larvae noted:

a) On floors or walls Yes/No*
b) On outsides of bags of AGPI Yes/No*
c) In accumulations of spilled AGPI Yes/No*
d) In samples taken from stacks of AGPI (on separate sheet list lots of AGPI sampled and insects present, if any) Yes/No*

E-7.3 Insect tracks in dust on walls, floors and overhead areas Yes/No*

E-8. RODENT, BIRD AND/OR MICROBIAL CONDITIONS

E-8.1 Live or dead rodents noted in warehouse Yes/No*

E-8.2 Rodent pellets noted in warehouse or on bags of AGPI Yes/No*

E-8.3 Rodent urine stains on bags Yes/No*

E-8.4 Rodent chewed bags Yes/No*

E-8.5 Rodent tracks noted in dust Yes/No*

E-8.6 Birds noted in warehouse Yes/No*

E-8.7 Bird droppings on bags, floors and overhead areas Yes/No*

E-8.8 Moulded or sprouted AGPI noted Yes/No*

E-9. PEST CONTROL

E-9.1 Insect

E-9.1.1 Regularly scheduled residual spraying of warehouse practised:

a) Frequency———————————— Yes/No*
b) Insecticide used———————————— Yes/No*

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*Strike out whichever is not applicable.

E-9.1.2 Is warehouse being treated with smokes or fogs:

a) Frequency——————————— Yes/No*
b) Insecticide used—————————— Yes/No*

E-9.1.3 Grain fumigated when received:
Fumigant used—————————— Yes/No*

E-9.1.4 Protective treatment applied when received:

a) Applied to bags—————————— Yes/No*
b) Applied to grain—————————— Yes/No*
c) Material applied—————————— Yes/No*

E-9.1.5 AGPI fumigated as required Yes/No*

E-9.2 Rodent

E-9.2.1 Rodent bait stations maintained on warehouse exterior Yes/No*

E-9.2.2 Rodent bait stations maintained on warehouse interior Yes/No*

E-9.2.3 Rodent traps maintained on warehouse interior Yes/No*

E-9.2.4 Bait stations serviced with fresh bait regularly:

a) Type of bait used—————————— Yes/No*
b) Frequency of service—————————— Yes/No*

E-9.3 Birds

E-9.3.1 Baits in use (Type——————) Yes/No*

E-9.3.2 Traps in use Yes/No*

E-10. RECOMMENDATIONS/REMARKS

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*Strike out whichever is not applicable.

(*Continued from page* 2)

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Director	Food & Supplies Department, Government of Punjab, Chandigarh
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Civil Engineer (*Alternate*)	
Shri R. P. Jain	The Roller Flour Millers' Federation of India, New Delhi
Shri Raghunandan Bhatia (*Alternate*)	
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Shri J. P. Mital (*Alternate*)	
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Shri P. Ramdas	Central Warehousing Corporation, New Delhi
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Shri S. S. Virdi	National Seeds Corporation Limited, New Delhi
Shri R. Kurmanaikulu (*Alternate*)	

INDIAN STANDARDS

ON

STORAGE AND MARKETING STRUCTURES FOR AGRICULTURAL COMMODITIES

IS:

600-1955	Code of practice for construction of *BUKHARI* type rural food grain storage structure
601-1955	Code of practice for construction of *KOTHAR* type food grain storage structure
602-1955	Code of practice for construction of *MORAI* type rural food grain storage structure
603-1960	Code of practice for construction of underground rural food grain storage structure
607-1965	Code of practice for construction of bagged food grain storage structures suitable for trade and government purposes (*revised*)
609-1955	Code of practice for improvement of existing structures used or intended to be used for food grain storage
610-1955	Code of practice for storage of food grain and its protection during storage
611-1955	Code of practice for handling of food grain in transit
631-1961	Specification for aluminium food grain storage bins
1497-1959	Layout for regulated market yards for agricultural commodities
1787-1961	Layout for regulated market yards for fruits and vegetables
1788-1961	Layout for regulated market yards for cattle
2059-1962	Layout for regulated market yards for tobacco
2821-1964	Thermo-sampler
3453-1966	Code of practice for construction of hexagonal type concrete-cum-masonry bins for bulk storage of food grains
5503 (Part I)-1969	General requirements for silos for grain storage: Part I Constructional requirements
5503 (Part II)-1969	General requirements for silos for grain storage: Part II Grain handling equipment and accessories
5606-1970	Specification for steel bins for grain storage
5826-1970	Constructional requirements for flat storage structures for grains (capacity above 200 tonnes)